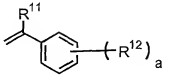
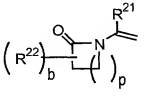
What is claimed is:

1. An antimicrobial lens comprising silver and a polymer comprising a monomer of Formula I, II, III or IV

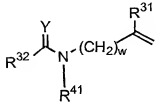
I



II



III



IV

wherein

R^1 is hydrogen or C_{1-6}alkyl;

R^2 is $-OR^3$, $-NH-R^3$, $-S-(CH_2)_d-R^3$, or $-(CH_2)_d-R^3$, wherein

d is 0-8;

R^3 is substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and

phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^4R^5)_q-(CHR^6)_m-SO_3H$

wherein R^4, R^5, and R^6 are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^7CH_2$,

wherein R^7 is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^8R^9)_t-(CHR^{10})_u-P(O)(OH)_2$

wherein R^8, R^9, and R^{10} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl,

N-(aminobenzothiazolyl)sulfonyl,
N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen,

hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

a is 1-5;

R^{11} is hydrogen or C_{1-6}alkyl;

R^{12} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, acetamide, thioC_{1-6}alkylcarbonyl, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, $-OR^{13}$, $-NH-R^{13}$, $-S-(CH_2)_d-R^{13}$, $-(CH_2)_d-R^{13}$, $-C(O)NH--(CH_2)_d-R^{13}$, $-C(O)-(CH_2)_d-R^{13}$, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted phenylthiourea or substituted C_{1-6}alkylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

where

d is 0-8;

R^{13} is thioC_{1-6}alkylcarbonyl;

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the

group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{14}R^{15})_q-(CHR^{16})_m-SO_3H$

where R^{14}, R^{15}, and R^{16} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{17}CH_2$,

where R^{17} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{18}R^{19})_t-(CHR^{20})_u-P(O)(OH)_2$

where R^{18}, R^{19}, and R^{20} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;

triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl
wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl,

N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic

acid, amine, amidine, acetamide, and nitrile;

b is 1-5;

p is 1-5;

R^{21} is hydrogen;

R^{22} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, C_{1-6}alkyldisulfide, phenyldisulfide, $-C(O)NH(CH_2)_{1-6}-SO_3H$, $-C(O)NH(CH_2)_{1-6}-P(O)(OH)_2$, $-OR^{23}$, $-NH-R^{23}$, $-C(O)NH-(CH_2)_d-R^{23}$, $-S-(CH_2)_d-R^{23}$, $-(CH_2)_d-R^{23}$, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted, C_{1-6}alkylthiourea substituted phenylurea or substituted phenylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile,

where

d is 0-8;

R^{23} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{24}R^{25})_q-(CHR^{26})_m-SO_3H$

where R^{24}, R^{25}, and R^{26} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6

$-(CH_2)_n-S-S-(CH_2)_x-NH-C(O)CR^{27}CH_2$,

where R^{27} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{28}R^{29})_t-(CHR^{30})_u-P(O)(OH)_2$

where R^{28}, R^{29}, and R^{30} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;
indolyl;
thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl,

N-(aminopyrazine)phosphonyl,
N-(aminobenzimidazolyl)sulfonyl,
N-(aminobenzothiazolyl)sulfonyl,
N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide,
nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl
disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea,
C_{1-6}alkylthiourea, phenylthiourea, substituted
C_{1-6}alkyldisulfide, substituted phenyldisulfide,
substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea,
substituted phenylurea, and substituted phenylthiourea
wherein the C_{1-8}alkyldisulfide, phenyldisulfide,
C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and

phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

w is 0-1;

Y is oxygen or sulfur;

R^{31} is hydrogen or C_{1-6}alkyl;

R^{32} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, $-C(O)NH-(CH_2)_d-R^{33}$, $-O-R^{33}$, $-NH-R^{33}$, $-S-(CH_2)_d-R^{33}$, $-(CH_2)_d-R^{33}$, C_{1-6}alkyldisulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, C_{1-6}alkylamine, phenylamine, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted phenylurea, substituted C_{1-6}alkylamine, substituted phenylamine, substituted phenylthiourea, substituted C_{1-6}alkylurea or substituted C_{1-6}alkylthiourea wherein the substitutents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile

where

d is 0-8;

R^{33} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted

C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea or substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{34}R^{35})_q-(CHR^{36})_m-SO_3H$

where R^{34}, R^{35}, and R^{36} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_x NH-C(O)CR^{37}CH_2$,

where R^{37} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{38}R^{39})_t-(CHR^{40})_u-P(O)(OH)_2$

where R^{38}, $R3^9$, and R^{40} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;
benzimidazolyl;
benzothiazolyl;
benzotriazolyl;
naphthaloyl;
quinolinyl;
indolyl;
thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl,

N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl,
N-(2-aminopyrimidine)carbonyl,
N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl,
N-(2-aminopyrimidine)phosphonyl,
N-(2-aminopyridine)phosphonyl,
N-(aminopyrazine)phosphonyl,
N-(aminobenzimidazolyl)sulfonyl,
N-(aminobenzothiazolyl)sulfonyl,
N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide,
nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl
disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea,
C_{1-6}alkylthiourea, phenylthiourea, substituted

C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

R^{41} is hydrogen, C_{1-6}alkyl, phenyl, C_{1-6}alkylcarbonyl, phenylcarbonyl, substituted C_{1-6}alkyl, substituted phenyl, substituted C_{1-6}alkylcarbonyl or substituted phenylcarbonyl,

wherein

the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile.

2. The antimicrobial lens of claim 1 comprising a polymer comprising a monomer of Formula I.

3. The antimicrobial lens of claim 2 wherein,

R^1 is hydrogen or C_{1-3}alkyl;

R^2 is NH-R^3;

d is 0

R^3 is substituted phenyl, -$(CR^4R^5)_q$-$(CHR^6)_m$-SO_3H, -$(CR^8R^9)_t$-$(CHR^{10})_u$-$P(O)(OH)_2$ or -$(CH_2)_n$-S-S-$(CH_2)_x$NH-C(O)CR^7CH_2;

R^4 is hydrogen or C_{1-3}alkyl;

R^5 is hydrogen or C_{1-3}alkyl;

R^6 is hydrogen or C_{1-3}alkyl;

q is 1-3;

m is 1-3;
R^7 is hydrogen or C_{1-3}alkyl;
R^8 is hydrogen or C_{1-3}alkyl;
R^9 is hydrogen or C_{1-3}alkyl;
R^{10} is hydrogen or C_{1-3}alkyl;
t is 1-3;
u is 1-3;
n is 2-4; and
x is 2-4.

4. The antimicrobial lens of claim 2 wherein the lens is a soft contact lens.

5. The antimicrobial lens of claim 2 wherein the monomer of Formula I is present at about 0.01 to about 1.5 weight percent.

6. The antimicrobial lens of claim 2 wherein the monomer of Formula I is present at about 0.01 to about 0.8 weight percent.

7. The antimicrobial lens of claim 2 wherein the monomer of Formula I is present at about 0.01 to about 0.3 weight percent.

8. The antimicrobial lens of claim 2 wherein the monomer of Formula I is present at about 0.01 to about 0.2 weight percent.

9. The antimicrobial lens of claim 2 wherein the monomer of Formula I is present at about 0.01 to about 0.09 weight percent.

10. The antimicrobial lens of claim 2 wherein the lens is a silicone hydrogel.

11. The antimicrobial lens of claim 2 wherein, the lens is etafilcon A, balafilcon, A, acquafilcon A, lenefilcon A, or lotrafilcon A.

12. The antimicrobial lens of claim 2 wherein,

R^1 is hydrogen or methyl;

R^2 is NH-R^3;

R^3 is -$(CR^4R^5)_q$-$(CHR^6)_m$-SO_3H, -$(CR^8R^8)_t$-$(CHR^{10})_u$-$P(O)(OH)_2$ or -$(CH_2)_n$-S-S-$(CH_2)_x$NH-C(O)CHR^7CH_2;

R^4 is hydrogen or methyl;

R^5 is hydrogen or methyl;

q is 1-2;

m is 1-2;

R^6 is hydrogen or methyl;

R^7 is hydrogen;

R^8 is hydrogen or methyl;

R^9 is hydrogen or methyl;

R^{10} is hydrogen or methyl;

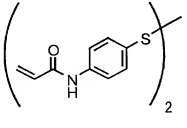
t is 1;

u is 1-2;

n is 2-3; and

x is 2-3.

13. The antimicrobial lens of claim 2 wherein the monomer of Formula I is selected from the group consisting of



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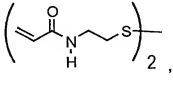

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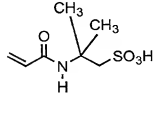
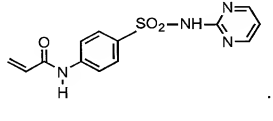


and


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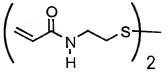
14. The antimicrobial lens of claim 2 wherein silver is present at about 20 ppm to about 1,200 ppm.

15. The antimicrobial lens of claim 2 wherein silver is present at about 20 ppm to about 600 ppm.

16. The antimicrobial lens of claim 2 wherein silver is present at about 20 ppm to about 150 ppm.

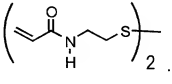
17. The antimicrobial lens of claim 2 wherein silver is present at about 20 ppm to about 75 ppm.

18. The antimicrobial lens of claim 2 wherein the lens is a silicone hydrogel and the monomer of Formula I is



19. The antimicrobial lens of claim 18 wherein silver is present at about 20 ppm to about 150 ppm and the monomer of Formula I is present at about 0.01 to about 1.5 weight percent.

20. The antimicrobial lens of claim 2 wherein the lens is etafilcon A, balafilcon, A, acquafilcon A, lenefilcon, or lotrafilcon A and the monomer of Formula I is



21. The antimicrobial lens of claim 20 wherein silver is present at about 20

ppm to about 150 ppm and the monomer of Formula I is present at about 0.01 to about 1.5 weight percent.

22. The antimicrobial lens of claim 21 wherein the lens is etafilcon A.

23. The antimicrobial lens of claim 21 wherein the lens is acquafilcon A.

24. The lens of claim 23 wherein silver is present at about 20 ppm to about 75 ppm.

25. The antimicrobial lens of claim 1 comprising a polymer comprising a monomer of Formula II.

26. The antimicrobial lens of claim 25 wherein,

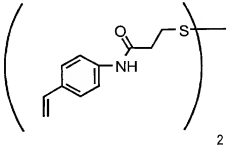
a is 1-2,

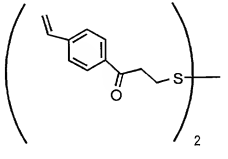
R^{11} is hydrogen or C_{1-3}alkyl,

R^{12} is sulfonic acid, carboxylic acid, phosphonic acid, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, substiuted phenyldisulfide or NH-R^{13},

R^{13} is thioC_{1-6}alkylcarbonyl.

27. The antimicrobial lens of claim 25 wherein the monomer of Formula II is selected from the group consisting of



2 ,


2 ,


and


28. The antimicrobial lens of claim 25 wherein the lens is a soft contact lens.

29. The antimicrobial lens of claim 25 wherein the monomer of Formula II is present at about 0.01 to about 1.5 weight percent.

30. The antimicrobial lens of claim 25 wherein the monomer of Formula II is present at about 0.01 to about 0.8 weight percent.

31. The antimicrobial lens of claim 25 wherein the monomer of Formula II is present at about 0.01 to about 0.3 weight percent.

32. The antimicrobial lens of claim 25 wherein the lens is etafilcon A, balafilcon, A, acquafilcon A, lenefilcon A, or lotrafilcon A.

33. The antimicrobial lens of claim 25 wherein silver is present at about 20 ppm to about 150 ppm and the monomer of Formula II is present at about 0.01 to about 1.5 weight percent.

34. The antimicrobial lens of claim 33 wherein the lens is etafilcon A or acquafilcon A.

35. The antimicrobial lens of claim 1 comprising a polymer comprising a monomer of Formula III.

36. The antimicrobial lens of claim 35 wherein,

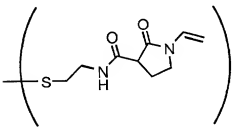
p is 1-3;

b is 1-2;

R^{21} is hydrogen;

R^{22} is sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, substiuted phenyldisulfide, H_3OS-$(CH_2)_{1-6}$NHC(O) or $(HO)_2(O)P$-$(CH_2)_{1-6}$NHC(O)-.

37. The antimicrobial lens of claim 35 wherein the monomer of Formula III is selected from the group consisting of



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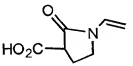

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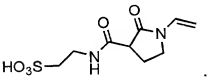

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38. The antimicrobial lens of claim 35 wherein the lens is a soft contact lens.

39. The antimicrobial lens of claim 35 wherein the monomer of Formula III is present at about 0.01 to about 1.5 weight percent.

40. The antimicrobial lens of claim 35 wherein the monomer of Formula III is present at about 0.01 to about 0.8 weight percent.

41. The antimicrobial lens of claim 35 wherein the monomer of Formula III is present at about 0.01 to about 0.3 weight percent.

42. The antimicrobial lens of claim 35 wherein, the lens is etafilcon A, balafilcon, A, acquafilcon A, lenefilcon A, or lotrafilcon A.

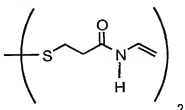
43. The antimicrobial lens of claim 35 wherein silver is present at about 20 ppm to about 150 ppm and the monomer of Formula III is present at about 0.01 to about 1.5 weight percent.

44. The antimicrobial lens of claim 43 wherein the lens is etafilcon A or acquafilcon A.

45. The antimicrobial lens of claim 1 comprising a polymer comprising a monomer of Formula IV.

46. The antimicrobial lens of claim 45 wherein,
w is 0-1;
R^{31} is hydrogen;
R^{32} is amine, C_{1-3}alkylamine, phenylamine, substituted phenylamine; thioC_{1-3}alkylcarbonyl;
R^{41} is hydrogen.

47. The antimicrobial lens of claim 45 wherein the monomer of Formula IV is selected from the group consisting of



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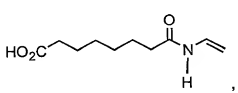

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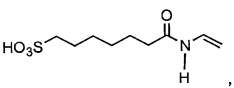
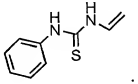


, and


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48. The antimicrobial lens of claim 45 wherein the lens is a soft contact lens.

49. The antimicrobial lens of claim 45 wherein the monomer of Formula IV is present at about 0.01 to about 1.5 weight percent.

50. The antimicrobial lens of claim 45 wherein the monomer of Formula IV is present at about 0.01 to about 0.8 weight percent.

51. The antimicrobial lens of claim 45 wherein the monomer of Formula IV is present at about 0.01 to about 0.3 weight percent.

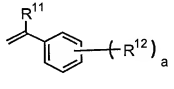
52. The antimicrobial lens of claim 45 wherein the lens is etafilcon A, balafilcon, A, acquafilcon A, lenefilcon A, or lotrafilcon A.

53. The antimicrobial lens of claim 45 wherein silver is present at about 20 ppm to about 150 ppm and the monomer of Formula IV is present at about 0.01 to about 1.5 weight percent.

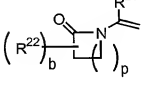
54. The antimicrobial lens of claim 53 wherein the lens is etafilcon A or acquafilcon A.

55. A method of producing an antimicrobial lens comprising, silver and a polymer comprising a monomer of Formula I, II, III or IV

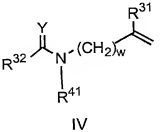
I



II



III



IV

wherein

R^1 is hydrogen or C_{1-6}alkyl;

R^2 is $-OR^3$, $-NH-R^3$, $-S-(CH_2)_d-R^3$, or $-(CH_2)_d-R^3$, wherein

d is 0-8;

R^3 is substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^4R^5)_q-(CHR^6)_m-SO_3H$

wherein R^4, R^5, and R^6 are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^7CH_2$,

wherein R^7 is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^8R^9)_t-(CHR^{10})_u-P(O)(OH)_2$

wherein R^8, R^9, and R^{10} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;

triazolyl;

4-methylpiperidin-1-yl;

4-methylpiperazin-1-yl;

substituted phenyl;

substituted benzyl;

substituted pyridinyl;

substituted pyrimidinyl;

substituted pyrazinyl;

substituted benzimidazolyl;

substituted benzothiazolyl;

substituted benzotriazolyl;

substituted naphthaloyl;

substituted quinolinyl;

substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,
wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl, N-(aminobenzotriazolyl)sulfonyl, N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl, N-(aminotriazolyl)sulfonyl, N-(amino-4-methylpiperidinyl)sulfonyl, N-(amino-4-methylpiperazinyl)sulfonyl, N-(aminobenzimidazolyl)carbonyl, N-(aminobenzothiazolyl)carbonyl, N-(aminobenzotriazolyl)carbonyl, N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl, N-(aminotriazolyl)carbonyl, N-(amino-4-methylpiperidinyl)carbonyl, N-(amino-4-methylpiperazinyl)carbonyl, N-(2-aminobenzimidazolyl)phosphonyl,

N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

a is 1-5;

R^{11} is hydrogen or C_{1-6}alkyl;

R^{12} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, acetamide, thioC_{1-6}alkylcarbonyl, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, $-OR^{13}$, $-NH-R^{13}$, $-S-(CH_2)_d-R^{13}$, $-(CH_2)_d-R^{13}$, $-C(O)NH-(CH_2)_d-R^{13}$, $-C(O)-(CH_2)_d-R^{13}$, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted phenylthiourea or substituted C_{1-6}alkylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

where

d is 0-8;

R^{13} is thioC_{1-6}alkylcarbonyl;

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{14}R^{15})_q-(CHR^{16})_m-SO_3H$

where R^{14}, R^{15}, and R^{16} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{17}CH_2$,

where R^{17} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{18}R^{19})_t-(CHR^{20})_u-P(O)(OH)_2$

where R^{18}, R^{19}, and R^{20} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;

triazolyl;

4-methylpiperidin-1-yl;

4-methylpiperazin-1-yl;

substituted phenyl;

substituted benzyl;

substituted pyridinyl;

substituted pyrimidinyl;

substituted pyrazinyl;

substituted benzimidazolyl;

substituted benzothiazolyl;

substituted benzotriazolyl;

substituted naphthaloyl;

substituted quinolinyl;

substituted indolyl;

substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl, N-(aminobenzotriazolyl)sulfonyl, N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl, N-(aminotriazolyl)sulfonyl, N-(amino-4-methylpiperidinyl)sulfonyl, N-(amino-4-methylpiperazinyl)sulfonyl, N-(aminobenzimidazolyl)carbonyl, N-(aminobenzothiazolyl)carbonyl, N-(aminobenzotriazolyl)carbonyl, N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl, N-(aminotriazolyl)carbonyl, N-(amino-4-methylpiperidinyl)carbonyl, N-(amino-4-methylpiperazinyl)carbonyl, N-(2-aminobenzimidazolyl)phosphonyl, N-(2-aminobenzothiazolyl)phosphonyl,

N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

b is 1-5;

p is 1-5;

R^{21} is hydrogen;

R^{22} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, C_{1-6}alkyldisulfide, phenyldisulfide, $-C(O)NH(CH_2)_{1-6}-SO_3H$, $-C(O)NH(CH_2)_{1-6}-P(O)(OH)_2$, $-OR^{23}$, $-NH-R^{23}$, $-C(O)NH-(CH_2)_d-R^{23}$, $-S-(CH_2)_d-R^{23}$, $-(CH_2)_d-R^{23}$, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted, C_{1-6}alkylthiourea substituted phenylurea or substituted phenylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl,

carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile,

where

d is 0-8;

R^{23} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{24}R^{25})_q-(CHR^{26})_m-SO_3H$

where R^{24}, R^{25}, and R^{26} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{27}CH_2$,

where R^{27} is hydrogen or C_{1-6}alkyl,
n is 1-6, and
x is 1-6;

$-(CR^{28}R^{29})_t-(CHR^{30})_u-P(O)(OH)_2$

where R^{28}, R^{29}, and R^{30} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,
t is 1-6, and
u is 0-6;

phenyl;
benzyl;
pyridinyl;
pyrimidinyl;
pyrazinyl;
benzimidazolyl;
benzothiazolyl;
benzotriazolyl;
naphthaloyl;
quinolinyl;
indolyl;
thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;

substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl, N-(aminobenzotriazolyl)sulfonyl, N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl, N-(aminotriazolyl)sulfonyl, N-(amino-4-methylpiperidinyl)sulfonyl, N-(amino-4-methylpiperazinyl)sulfonyl, N-(aminobenzimidazolyl)carbonyl, N-(aminobenzothiazolyl)carbonyl, N-(aminobenzotriazolyl)carbonyl, N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl, N-(aminotriazolyl)carbonyl,

N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

w is 0-1;

Y is oxygen or sulfur;

R^{31} is hydrogen or C_{1-6}alkyl;

R^{32} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, -C(O)NH-$(CH_2)_d$-R^{33}, -O-R^{33}, -NH-R^{33}, -S-$(CH_2)_d$-R^{33}, -$(CH_2)_d$-R^{33}, C_{1-6}alkyldisulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, C_{1-6}alkylamine, phenylamine, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted

phenylurea, substituted C_{1-6}alkylamine, substituted phenylamine, substituted phenylthiourea, substituted C_{1-6}alkylurea or substituted C_{1-6}alkylthiourea wherein the substitutents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile

where

d is 0-8;

R^{33} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea or substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{34}R^{35})_q-(CHR^{36})_m-SO_3H$

where R^{34}, R^{35}, and R^{36} are independently selected

from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,
q is 1-6, and
m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{37}CH_2$,
where R^{37} is hydrogen or C_{1-6}alkyl,
n is 1-6, and
x is 1-6;

$-(CR^{38}R^{39})_t-(CHR^{40})_u-P(O)(OH)_2$
where R^{38}, $R3^9$, and R^{40} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,
t is 1-6, and
u is 0-6;

phenyl;
benzyl;
pyridinyl;
pyrimidinyl;
pyrazinyl;
benzimidazolyl;
benzothiazolyl;
benzotriazolyl;
naphthaloyl;
quinolinyl;
indolyl;
thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;

substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl, N-(aminobenzotriazolyl)sulfonyl, N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl, N-(aminotriazolyl)sulfonyl, N-(amino-4-methylpiperidinyl)sulfonyl, N-(amino-4-methylpiperazinyl)sulfonyl,

N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

R^{41} is hydrogen, C_{1-6}alkyl, phenyl, C_{1-6}alkylcarbonyl, phenylcarbonyl, substituted C_{1-6}alkyl, substituted phenyl, substituted C_{1-5}alkylcarbonyl or substituted phenylcarbonyl,

wherein

the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile.

where the method comprises the steps of

(a) preparing a lens comprising a monomer of Formula I, II, III or IV and

(b) treating said lens with a silver solution.

56. The method of claim 55 wherein the silver solution is aqueous silver nitrate having a concentration of about 0.1 µg/mL to about .3 g/mL.

57. The method of claim 55 wherein, treating comprises soaking the lens comprising a polymer of a monomer of Formula I, II, III or IV with a silver solution.

58. The method of claim 55 wherein, the lens comprising a polymer of a monomer of Formula I, II, III or IV is soaking for about 2 minutes to about 2 hours.

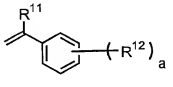
59. The method of claim 55 wherein, treating comprises storing the lens comprising a polymer of a monomer of Formula I, II, III or IV with a silver solution for about 20 minutes to about 5 years.

60. An antimicrobial lens comprising silver and a polymer comprising a binding monomer wherein said antimicrobial lens can reversibly bind silver.

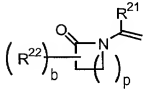
61. The antimicrobial lens of claim 60 wherein the binding monomer has a stability constant of about 2 to about 7.3.

62. A lens case comprising silver and a polymer comprising a monomer of Formula I, II, III or IV

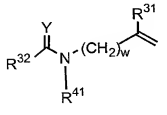
I



II



III



IV

wherein

R^1 is hydrogen or C_{1-6}alkyl;

R^2 is $-OR^3$, $-NH-R^3$, $-S-(CH_2)_d-R^3$, or $-(CH_2)_d-R^3$, wherein

d is 0-8;

R^3 is substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and

phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^4R^5)_q-(CHR^6)_m-SO_3H$

wherein R^4, R^5, and R^6 are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^7CH_2$,

wherein R^7 is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^8R^9)_t-(CHR^{10})_u-P(O)(OH)_2$

wherein R^8, R^9, and R^{10} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,
wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl,

N-(aminobenzothiazolyl)sulfonyl,
N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen,

hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

a is 1-5;

R^{11} is hydrogen or C_{1-6}alkyl;

R^{12} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, acetamide, thioC_{1-6}alkylcarbonyl, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, $-OR^{13}$, $-NH-R^{13}$, $-S-(CH_2)_d-R^{13}$, $-(CH_2)_d-R^{13}$, $-C(O)NH--(CH_2)_d-R^{13}$, $-C(O)-(CH_2)_d-R^{13}$, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted phenylthiourea or substituted C_{1-6}alkylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

where

d is 0-8;

R^{13} is thioC_{1-6}alkylcarbonyl;

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the

group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{14}R^{15})_q-(CHR^{16})_m-SO_3H$

where R^{14}, R^{15}, and R^{16} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{17}CH_2$,

where R^{17} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{18}R^{19})_t-(CHR^{20})_u-P(O)(OH)_2$

where R^{18}, R^{19}, and R^{20} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;

indolyl;

thiadiazolyl;

triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl

wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl, N-(aminopyrazine)phosphonyl, N-(aminobenzimidazolyl)sulfonyl, N-(aminobenzothiazolyl)sulfonyl,

N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic

acid, amine, amidine, acetamide, and nitrile;

b is 1-5;

p is 1-5;

R^{21} is hydrogen;

R^{22} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, C_{1-6}alkyldisulfide, phenyldisulfide, -C(O)NH$(CH_2)_{1-6}$-SO_3H, -C(O)NH$(CH_2)_{1-6}$-P(O)$(OH)_2$, -OR^{23}, -NH-R^{23}, -C(O)NH-$(CH_2)_d$-R^{23}, -S-$(CH_2)_d$-R^{23}, -$(CH_2)_d$-R^{23}, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted, C_{1-6}alkylthiourea substituted phenylurea or substituted phenylthiourea wherein the substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile,

where

d is 0-8;

R^{23} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{24}R^{25})_q-(CHR^{26})_m-SO_3H$

where R^{24}, R^{25}, and R^{26} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6

$-(CH_2)_n-S-S-(CH_2)_x-NH-C(O)CR^{27}CH_2$,

where R^{27} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{28}R^{29})_t-(CHR^{30})_u-P(O)(OH)_2$

where R^{28}, R^{29}, and R^{30} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;

pyrazinyl;

benzimidazolyl;

benzothiazolyl;

benzotriazolyl;

naphthaloyl;

quinolinyl;
indolyl;
thiadiazolyl;
triazolyl;
4-methylpiperidin-1-yl;
4-methylpiperazin-1-yl;
substituted phenyl;
substituted benzyl;
substituted pyridinyl;
substituted pyrimidinyl;
substituted pyrazinyl;
substituted benzimidazolyl;
substituted benzothiazolyl;
substituted benzotriazolyl;
substituted naphthaloyl;
substituted quinolinyl;
substituted indolyl;
substituted thiadiazolyl;
substituted triazolyl;
substituted 4-methylpiperidin-1-yl; or
substituted 4-methylpiperazin-1-yl,
wherein the substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, sulfonic acid, phosphonic acid, hydroxyl, carboxylic acid, amine, amidine, N-(2-aminopyrimidine)sulfonyl, N-(aminopyridine)sulfonyl, N-(aminopyrazine)sulfonyl, N-(2-aminopyrimidine)carbonyl, N-(aminopyridine)carbonyl, N-(aminopyrazine)carbonyl, N-(2-aminopyrimidine)phosphonyl, N-(2-aminopyridine)phosphonyl,

N-(aminopyrazine)phosphonyl,
N-(aminobenzimidazolyl)sulfonyl,
N-(aminobenzothiazolyl)sulfonyl,
N-(aminobenzotriazolyl)sulfonyl,
N-(aminoindolyl)sulfonyl, N-(aminothiazolyl)sulfonyl,
N-(aminotriazolyl)sulfonyl,
N-(amino-4-methylpiperidinyl)sulfonyl,
N-(amino-4-methylpiperazinyl)sulfonyl,
N-(aminobenzimidazolyl)carbonyl,
N-(aminobenzothiazolyl)carbonyl,
N-(aminobenzotriazolyl)carbonyl,
N-(aminoindolyl)carbonyl, N-(aminothiazolyl)carbonyl,
N-(aminotriazolyl)carbonyl,
N-(amino-4-methylpiperidinyl)carbonyl,
N-(amino-4-methylpiperazinyl)carbonyl,
N-(2-aminobenzimidazolyl)phosphonyl,
N-(2-aminobenzothiazolyl)phosphonyl,
N-(2-aminobenzotriazolyl)phosphonyl,
N-(2-aminoindolyl)phosphonyl,
N-(2-aminothiazolyl)phosphonyl,
N-(2-aminotriazolyl)phosphonyl,
N-(amino-4-methylpiperidinyl) phosphonyl,
N-(amino-4-methylpiperazinyl) phosphonyl, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyl disulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted C_{1-6}alkylthiourea, substituted phenylurea, and substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and

phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

w is 0-1;

Y is oxygen or sulfur;

R^{31} is hydrogen or C_{1-6}alkyl;

R^{32} is hydroxyl, sulfonic acid, phosphonic acid, carboxylic acid, thioC_{1-6}alkylcarbonyl, thioC_{1-6}alkylaminocarbonyl, -C(O)NH-$(CH_2)_d$-R^{33}, -O-R^{33}, -NH-R^{33}, -S-$(CH_2)_d$-R^{33}, -$(CH_2)_d$-R^{33}, C_{1-6}alkyldisulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, C_{1-6}alkylamine, phenylamine, substituted C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted phenylurea, substituted C_{1-6}alkylamine, substituted phenylamine, substituted phenylthiourea, substituted C_{1-6}alkylurea or substituted C_{1-6}alkylthiourea wherein the substitutents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile

where

d is 0-8;

R^{33} is thioC_{1-6}alkylcarbonyl,

C_{1-6}alkyl,

substituted C_{1-6}alkyl

where the alkyl substituents are selected from one or more members of the group consisting of C_{1-6}alkyl, halo C_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, nitrile, thiol, C_{1-6}alkyldisulfide, C_{1-6}alkylsulfide, phenyldisulfide, urea, C_{1-6}alkylurea, phenylurea, thiourea, C_{1-6}alkylthiourea, phenylthiourea, substituted

C_{1-6}alkyldisulfide, substituted phenyldisulfide, substituted C_{1-6}alkylurea, substituted phenylurea, substituted C_{1-6}alkylthiourea or substituted phenylthiourea

wherein the C_{1-6}alkyldisulfide, phenyldisulfide, C_{1-6}alkylurea, C_{1-6}alkylthiourea, phenylurea, and phenylthiourea substituents are selected from the group consisting of C_{1-6}alkyl, haloC_{1-6}alkyl, halogen, hydroxyl, carboxylic acid, sulfonic acid, phosphonic acid, amine, amidine, acetamide, and nitrile;

$-(CR^{34}R^{35})_q-(CHR^{36})_m-SO_3H$

where R^{34}, R^{35}, and R^{36} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

q is 1-6, and

m is 0-6;

$-(CH_2)_n-S-S-(CH_2)_xNH-C(O)CR^{37}CH_2$,

where R^{37} is hydrogen or C_{1-6}alkyl,

n is 1-6, and

x is 1-6;

$-(CR^{38}R^{39})_t-(CHR^{40})_u-P(O)(OH)_2$

where R^{38}, $R3^9$, and R^{40} are independently selected from the group consisting of hydrogen, halogen, hydroxyl, and C_{1-6}alkyl,

t is 1-6, and

u is 0-6;

phenyl;

benzyl;

pyridinyl;

pyrimidinyl;